

Workplace atmospheres - Part 2: Gas detectors -
Selection, installation, use and maintenance of
detectors for toxic gases and vapours

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN IEC 62990-2:2021 sisaldab Euroopa standardi EN IEC 62990-2:2021 ingliskeelset teksti.	This Estonian standard EVS-EN IEC 62990-2:2021 consists of the English text of the European standard EN IEC 62990-2:2021.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 30.07.2021.	Date of Availability of the European standard is 30.07.2021.
Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.	The standard is available from the Estonian Centre for Standardisation and Accreditation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 29.260.20

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation:

Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

ICS 29.260.20

English Version

**Workplace atmospheres - Part 2: Gas detectors - Selection,
installation, use and maintenance of detectors for toxic gases
and vapours
(IEC 62990-2:2021)**

Atmosphères des lieux de travail - Partie 2 : Détecteurs de
gaz - Sélection, installation, utilisation et maintenance des
détecteurs de gaz et de vapeurs toxiques
(IEC 62990-2:2021)

Arbeitsplatzatmosphäre - Teil 2: Gasmessgeräte - Auswahl,
Installation, Einsatz und Wartung von Gasmessgeräten für
toxische Gase und Dämpfe
(IEC 62990-2:2021)

This European Standard was approved by CENELEC on 2021-07-09. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 31/1566/FDIS, future edition 1 of IEC 62990-2, prepared by IEC/TC 31 "Equipment for explosive atmospheres" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62990-2:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2022-04-09 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-07-09 document have to be withdrawn

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 62990-2:2021 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60079-10-1	NOTE	Harmonized as EN IEC 60079-10-1
IEC 60079-0	NOTE	Harmonized as EN IEC 60079-0

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60079-29-2	-	Explosive atmospheres - Part 29-2: Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen	EN 60079-29-2	-
IEC 62990-1	-	Workplace atmospheres - Part 1: Gas-detectors - Performance requirements of detectors for toxic gases		-

INTERNATIONAL STANDARD



**Workplace atmospheres –
Part 2: Gas detectors – Selection, installation, use and maintenance of detectors
for toxic gases and vapours**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC online collection - oc.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Preview generated by EVS

INTERNATIONAL STANDARD



**Workplace atmospheres –
Part 2: Gas detectors – Selection, installation, use and maintenance of detectors
for toxic gases and vapours**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.260.20

ISBN 978-2-8322-9746-9

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Properties and detection of toxic gases and vapours	13
4.1 Properties and detection	13
4.2 The difference between detecting gases and vapours	14
4.3 Effects of water vapour on detection	17
4.4 Effects of temperature and pressure on detection	17
4.5 Effects of corrosion on detection	17
4.6 Detection by oxygen deficiency measurement	17
5 Measurement tasks	18
5.1 General.....	18
5.2 Exposure measurement (health monitoring)	18
5.3 General gas detection (safety monitoring)	19
6 Selection of equipment	20
6.1 General.....	20
6.2 Performance and electrical tests	21
6.3 Indication range, measuring range and uncertainty of measurement	21
6.4 Selectivity requirements	22
6.5 The influence of environmental conditions	23
6.6 The influence of electromagnetic interference	23
6.7 Time of response and time of recovery	24
6.8 Time to alarm.....	25
6.9 Data logging	25
6.10 Instruction manual	26
7 Design and installation of fixed toxic gas detection equipment.....	26
7.1 General.....	26
7.2 Basic considerations for the installation of fixed systems	27
7.3 Location of detection points	28
7.4 Access for calibration and maintenance	33
7.5 Additional considerations for sample lines.....	33
7.6 Summary of considerations for the location of sensors or sampling points	34
7.7 Installation of sensors	35
7.8 Integrity and safety of fixed systems	35
7.9 Commissioning	36
7.10 Operating instructions, plans and records	37
8 Operation of toxic gas detection equipment	38
8.1 Alarm setting.....	38
8.2 Operation of portable equipment	39
8.3 Operation of transportable and fixed equipment	43
8.4 Sample lines and sampling probes	45
8.5 Accessories	45
9 Maintenance and calibration	46
9.1 General.....	46

9.2	Sensor	46
9.3	Flow systems of aspirated equipment.....	46
9.4	Readout devices	47
9.5	Alarms	47
9.6	Maintenance	47
9.7	Calibration	48
9.8	Operation test	49
9.9	Records	50
10	Training.....	50
10.1	General.....	50
10.2	Operator training.....	50
10.3	Maintenance and calibration training.....	51
Annex A	(informative) Commonly used measurement principles.....	52
A.1	General.....	52
A.2	Chemiluminescence.....	52
A.3	Colorimetry	53
A.4	Electrochemical	54
A.5	Flame-ionization	55
A.6	Gas chromatography.....	55
A.7	Infrared photometry	56
A.8	Ion mobility spectrometry	57
A.9	Mass spectrometry.....	58
A.10	Photo-ionization.....	59
A.11	Semiconductor	60
A.12	Ultra-violet/visible photometry	61
Bibliography	62
Figure 1	– Relationship between indication range and measuring range (See 6.3.1)	11
Figure 2	– Example of zero uncertainty	11
Figure 3	– Example of warm-up time in clean air.....	12
Figure 4	– Relationship between indication range and measuring range	22
Figure 5	– Gas response curves for test gas volume fractions of 40 ppm and 100 ppm	24
Figure 6	– Time to alarm at 25 ppm set point for test gas volume fractions of 40 ppm and 100 ppm.....	25
Table A.1	– Chemiluminescence	52
Table A.2	– Colorimetry	53
Table A.3	– Electrochemical	54
Table A.4	– Flame-ionization	55
Table A.5	– Infrared photometry.....	56
Table A.6	– Ion mobility spectrometry	57
Table A.7	– Mass spectrometry.....	58
Table A.8	– Photo-ionization (PID).....	59
Table A.9	– Semiconductor	60
Table A.10	– Ultra-violet/visible photometry	61

INTERNATIONAL ELECTROTECHNICAL COMMISSION

WORKPLACE ATMOSPHERES –

Part 2: Gas detectors – Selection, installation, use and maintenance of detectors for toxic gases and vapours

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62990-2 has been prepared IEC technical committee 31: Equipment for explosive atmospheres and ISO technical committee 146: Air quality, sub-committee 2: Workplace atmospheres.

It is published as a double logo standard.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
31/1566/FDIS	31/1568/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62990, published under the general title *Workplace atmospheres*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Toxic gas detection equipment can be used whenever there is the possibility of a hazard to life or adverse health effects caused by the accumulation of a toxic gas or vapour. Such equipment can provide a means of reducing the exposure to the hazard by detecting the presence of a toxic gas or vapour and issuing suitable audible or visual warnings. Gas detectors can also be used to initiate precautionary steps (for example, plant shutdown and evacuation).

Performance requirements for gas detection equipment for workplace atmospheres are set out in IEC 62990 series standards.

However performance capability alone cannot ensure that the use of such equipment will properly safeguard life and health where toxic gases and vapours might be present. The level of safety obtained depends heavily upon correct selection, installation, calibration and periodic maintenance of the equipment, combined with knowledge of the limitations of the detection technique required. This cannot be achieved without responsible informed management.

This document has been specifically written to cover all the functions necessary from selection to ongoing maintenance for a successful gas detection operation.